

Sample: CDS130 Final exam (PART I)

The final exam consists of two sections. The first section is a closed-book paper exam (60 minutes); and the second section involves use of Matlab on the computer (75 minutes). The following part is the first section of the exam.

- Be sure your exam booklet has 8 pages for this section.
- Write your name at the top of each page.
- This is a closed book exam.
- All computational commands and statements appearing in this exam are specifically referring to the Matlab programming language taught in class.
- You may not use Matlab on the computer during this section.
- Absolutely no interaction between students is allowed.
- Each question is worth 5 points. Partial credit may be awarded ONLY if work is shown.
- The exam will take place in IN 326.
- Duration for this section: 60 minutes (10:30am – 11:30am).

**Q1.** Suppose x is a new variable, with the following Matlab statement,

```
x = [-10: -1: -15; -2: 3];
```

How many elements are generated in x?

- (A) 0; because there is an error in the assignment
- (B) 10
- (C) 12
- (D) 5
- (E) 6

Answer: \_\_\_\_\_

**Q2.** A matrix was generated using

```
M = rand(10);
```

Which of the following statements is **not** valid in Matlab?

- (A)  $M+M^*2$
- (B)  $M(1, :)^2$
- (C)  $\sin(M)$
- (D)  $\exp(M)$
- (E)  $M(10,10)+M(3,6)$

Answer: \_\_\_\_\_

**Q3.** What is the output of executing the following Matlab code?

```
clear;
for i=1:5
    for j=i:5
        M(i, j) = i+j;
        M(j, i) = M(i, j);
    end
end
M(4, 3)
```

Answer:

**Q4.** In order to print formatted integers with the following format,

```
00005
00006
00007
00008
00009
00010
```

which fprintf statement should be used in the following code?

```
for i=5:10
    fprintf(      )
end
```

- (A) fprintf('%5.5f\n', i)
- (B) fprintf('%5.2d\n', i)
- (C) fprintf('%05d', i)
- (D) fprintf('%5.5d\n', i)
- (E) fprintf('%d\n', i)

Answer: \_\_\_\_\_

**Q5.** Involving fprintf and nested for-loop commands, write a Matlab script to print the following pattern:

```
1
12
123
1234
123456
1234567
```

Answer:

**Q6.** Given the following Matlab code,

```
k= 0;
while k ^0.5 < k
    k = k + 1;
end
k
```

what is the value of k after executing the code ?

- (A) 0
- (B) 1
- (C) 2
- (D) 3
- (E) 4

Answer:\_\_\_\_\_

**Q7.** Using one if-statement to rewrite the following nested if-statement

```
if w < x
  if w > y
    w = x*y
  end if
end if
```

Answer:

**Q8.** Using nested for-loops to generate a matrix that has elements shown below (without typing the numbers explicitly):

$$A = \begin{pmatrix} 12 & 8 & 4 & 0 & -4 \\ 14 & 10 & 6 & 2 & -2 \\ 16 & 12 & 8 & 4 & 0 \end{pmatrix}$$

Answer:

**Q9.** Given vectors  $x=[-1, 2, 3, -2]$ ,  $y=[0.2, 3.1, 0, -3]$  and  $z=[3, 0, 1, 0.1]$ , provide answers to the following operations

(A)  $x < y > z$

Answer: \_\_\_\_\_

(B)  $x + \sim y > z$

Answer: \_\_\_\_\_

(C)  $x == y \sim z$

Answer \_\_\_\_\_

**Q10.** Images in Matlab are represented by matrices. In order to properly display the image with desired colors, a color map is needed (for indexed images). Given a matrix

$$M = \begin{pmatrix} 0.1 & 0.5 & 0.7 \\ 0.9 & 0.4 & 0.6 \\ 0.5 & 0.8 & 0.2 \end{pmatrix}$$

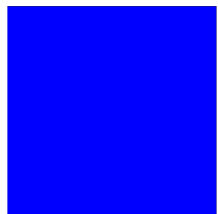
with the following Matlab code:

```
M=[0.1, 0.5, 0.7; 0.9, 0.4, 0.6; 0.5, 0.8, 0.2];
colormap(M);
imagesc(~(M>0.5))
axis square off
```

Which of the following statements is most likely correct?

(A) No image will be produced, because the colormap is not properly assigned.

(B) The following image will be produced:



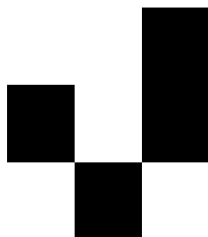
(C) The following 3-color image will be produced:



(D) The following 2-color image will be produced:



(E) The following white and black image will be produced:

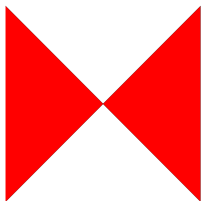


Answer: \_\_\_\_\_

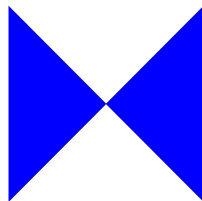
**Q11.** The 'fill' command can be used to plot polygons with filled colors. Which plot will be generated by executing the following command lines?

```
clear;  
fill([0, 1, 1, 0], [1,1, 0, 0], [0,0,1]);  
axis square off;
```

(A)



(B)



(C)



(D)



Answer:

**Q12.** Write a Matlab code to calculate the following summation:

$$3*(2+1)+4*(3+2+1)+5*(4+3+2+1)+6*(5+4+...+1)+....+1000*(999+...+1)$$

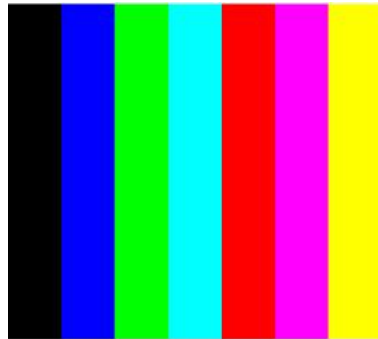


## Sample: CDS130 Final exam (PART II)

The final exam consists of two sections. The first section is a closed-book paper exam (60 minutes); and the second section involves use of Matlab on the computer (75 minutes). The following part is the section section of the exam.

- You are required to use Matlab to solve the problems.
- Absolutely no interaction between students is allowed.
- Partial credit may be awarded ONLY if work is shown.
- Turn in your Matlab code and final answer to each question by email or in paper form.
- Duration for this section: 70 minutes (11:30am – 12:45am).

1. (15 points) Write a Matlab script to create an image as follows:



2. (10 points) Given a mathematical function  $f(x) = x^2 - \sin(x)$ , calculate the area underneath the curve from  $x=1.3$ ,  $x = 8.7$ .

(3) (15 points) You won \$100 and want to invest it. Which bank offers the better deal?

Bank A: 12% interest per year compounded yearly

Bank B: 1% interest per month compounded monthly

Bank C:  $(1/365.2425)\%$  interest compounded daily

"Compounded yearly/monthly/daily" means that at the end of one year/month/day the interest is added to your balance.